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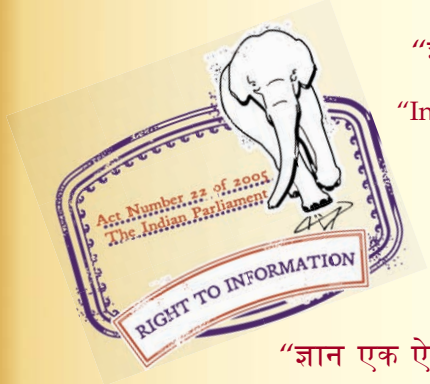
IS 7890 (1975): Ballistic galvanometers [ETD 12: Measuring Equipment for Basic Electrical Quantities]



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"Knowledge is such a treasure which cannot be stolen"

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IS : 7890 - 1975

(Reaffirmed 2005)

Indian Standard

SPECIFICATION FOR BALLISTIC GALVANOMETERS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 1976

Indian Standard

SPECIFICATION FOR BALLISTIC GALVANOMETERS

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Indian Standard

SPECIFICATION FOR BALLISTIC GALVANOMETERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 12 December 1975, after the draft finalized by the Electrical Instruments Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements and tests for ballistic galvanometers intended for use in laboratories for the measurement of quantity of electricity.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Ballistic Galvanometer — An instrument intended for detecting and measuring a quantity of electricity resulting due to the passage of transient current.

2.2 Body — The part in which the magnet, coil and suspension are fitted.

2.3 Coil — An arrangement of one or more turns of insulated copper wire.

2.4 Core — That part of the magnetic circuit around which the coil is placed and which helps in making the field radial.

2.5 Critical Damping — The least value of damping necessary to prevent oscillation.

*Rules for rounding off numerical values (*revised*).

2.6 Critical Damping Resistance — The resistance of the galvanometer corresponding to the critical damping condition.

2.7 Damping — The extent of reduction of amplitude of oscillation in an oscillatory system due to energy dissipation.

2.8 Magnetic Shunt — A piece of iron designed to carry part of the flux of a magnet or electromagnet in a measuring instrument, in order to control its action.

2.9 Mirror — A highly polished plane or concave surface, front silvered, capable of reflecting light rays without appreciable diffusion.

2.10 Period — The time for one complete oscillation of the moving coil.

2.11 Permanent Magnet — A magnet which exerts a permanent force on a current-carrying conductor placed in its field.

2.12 Sensitivity — The quantity of electricity (charge in coulomb) that shall be discharged through the galvanometer in order to produce a deflection of 1 mm on the scale. In the nonbuilt in lamp and scale type, sensitivity shall be specified in terms of deflection of 1 mm on the scale placed at a distance of one metre from the galvanometer moving system.

2.13 Suspension — The wire or strip from which the coil and the mirror are suspended and which provides the restoring torque for bringing back the coil to its original position.

2.14 Torsion Head — A knurled head fitted at the top of the body for zero adjustment.

2.15 Type Tests — Tests carried out to prove conformity with the requirements of this specification. These are intended to prove the general qualities and design of a given type of galvanometer.

2.16 Routine Tests — Tests carried out on each galvanometer to check requirements likely to vary during production.

3. GENERAL AND CONSTRUCTIONAL REQUIREMENTS

3.1 Body — The body of the galvanometer shall be made of a suitable non-magnetic material. It shall be fitted with three levelling screws of brass of diameter not less than 5·0 mm with knurled discs, the diameter and thickness of which shall be not less than 25 mm and 5 mm respectively. Levelling screws shall be provided with check nuts. It may be fitted with a sensitive circular spirit level to enable it to be adjusted to have the moving system in a freely hanging condition.

3.2 Torsion Head — The galvanometer shall be fitted with a torsion head of brass, gun metal or any other nonmagnetic material for zero adjustment at the top and provided with a clamping screw.

3.3 Permanent Magnet — The permanent magnet used shall have high coercivity with the required flux density. The magnet shall be stabilized and aged.

3.3.1 In external magnet construction, the permanent magnet shall be suitably shaped and provided with pole peices of soft iron properly protected against corrosion. The pole pieces shall be equal in dimensions and so shaped as to produce a uniform radial magnetic field in the air gap.

3.3.2 In internal magnet construction, the permanent magnet shall be suitably shaped and properly protected against corrosion.

3.4 Magnetic Screen — The galvanometer shall be provided with a suitable magnetic screen to avoid interference from external magnetic field.

NOTE — This will be separate enclosure, different from the body of the galvanometer (*see* **3.1**) which is nonmagnetic.

3.5 Core — In external magnet construction, the core shall be of spherical or cylindrical in shape according to the hole in the pole pieces and properly finished and coated to avoid corrosion.

3.5.1 In internal magnet construction (coaxial system), the external ring shall be properly finished and coated to avoid corrosion.

3.6 Coil — The former of coil, if provided, shall be of nonmagnetic and nonconducting material such as bakelite. It shall be rectangular or circular according to the shape of pole pieces of the magnet having channel at its peripheries. The insulated wire of appropriate size shall be wound layer by layer in the channel. The two ends of wire shall be connected to good conductive thin strips of copper fixed at the middle of opposite sides of the former. The winding of coil shall be properly varnished and backed so as to avoid absorption of moisture. The centre of the copper strips and that of former shall pass through the same line so as to keep the centre of gravity colinear in order to avoid the tilting of the coil while in motion. An arrangement shall be provided for clamping the coil, when not in use.

3.7 Suspension — The suspension shall be of a material of good tensile strength, such as phospher bronze in the form of thin strip or wire. The suspension shall be of as small a section as possible consistent with the mechanical strength. It shall be free from kinks.

3.8 Spring — It shall be a long helical spring because of its being more truely proportional and regular in behaviour. The number of convolutions shall be large so that the deformation per unit length of the spring material is small.

3.9 Mirror — The mirror shall be thin concave mirror of such a focal length as to form a reflected image on the scale placed at a distance of one metre. If plane mirror is used, focussing lens shall be provided for focussing the reflected image.

3.10 Damping — The galvanometer may be provided with a suitable critical damping resistance so that it may be used as an aperiodic galvanometer in which case copper strip shall be provided with the shunt in order to connect and disconnect the shunt from the galvanometer.

4. TIME PERIOD

4.1 The time period of the galvanometer shall be not less than 10 seconds.

5. INFORMATION TO BE SUPPLIED

5.1 The following information shall be supplied with the galvanometer:

a) Periodic time,

b) Sensitivity, and

c) Critical damping resistance.

6. MARKING

6.1 The ballistic galvanometer shall be marked with the following:

a) Manufacturer's name or trade-mark,

b) Manufacturer's serial number and type,

c) Nominal coil resistance, and

d) Country of manufacture.

6.1.1 The ballistic galvanometer may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7. TESTS

7.1 General Conditions for Tests — Unless otherwise specified, the tests shall be carried out under the following atmospheric conditions:

Temperature	15 to 35°C
Relative humidity	45 to 75 percent
Pressure	86 to 106 Pa

7.2 Classification of Tests — The tests shall be classified as follows:

a) Type tests, and

b) Routine tests.

7.2.1 *Type Tests* — The following shall constitute type tests and shall be carried out in the sequence given below:

a) Insulation resistance test (**7.3**),

b) High voltage test (**7.4**),

c) Sensitivity test (**7.5**),

d) Zero shift test (**7.6**),

e) Test for optical system (**7.7**), and

f) Periodic time test (**7.8**).

7.2.1.1 *Number of samples and criteria for conformity* — Type tests shall be applied to three test specimens; in the event of one specimen failing to comply in any respect, a further three specimens shall be taken all of which shall comply with the requirements of this standard.

7.2.2 *Routine Tests* — The following shall constitute routine tests and shall be carried out in the sequence given below:

a) Insulation resistance test (**7.3**),

b) High voltage test (**7.4**),

c) Sensitivity test (**7.5**), and

d) Test for optical system (**7.7**).

7.3 Insulation Resistance Test — When the moving system is insulated from the body of the galvanometer, the insulation resistance between the two terminals connected together and the metallic body or case when measured at 500 V dc after one minute of electrification shall be not less than 100 megohms.

7.4 High Voltage Test — When the moving system is insulated from the body of the galvanometer, no breakdown, arcing or sparking shall occur when an ac voltage of 1 000 volts (rms) is applied across the two terminals connected together and the metallic body or case for a period of one minute.

7.5 Sensitivity Test — The sensitivity of the galvanometer when new as measured at one-fourth, half, three-fourths and *full scale deflections on both sides of centre zero on the scale shall not differ by more than 5 percent of the stated value and shall not differ among themselves by more than 2 percent of the stated value.

7.6 Zero Shift Test — The zero position of the pointer shall be noted and the galvanometer given a signal to cause deflection over the full scale. The signal shall then be removed and the zero position noted again. The shift of the zero position shall not exceed 0·5 percent of full scale reading in either direction.

7.7 Test for Optical System — The component(s) used in the galvanometer for use as optical pointer shall be capable of giving a clear and well defined hair line of the spot whose thickness is not more than 0·1 of the least count of the scale when tested using the associated lamp, scale, etc.

7.8 Periodic Time Test — The measured periodic time of a galvanometer when new shall not differ from the stated value by more than 5 percent.

*The full scale deflection in the case of lamp and scale galvanometer shall be 10° from either side of zero.

INDIAN STANDARDS
ON
ELECTRICAL INSTRUMENTS

IS:

1248-1968 Direct acting electrical indicating instruments (*first revision*)

1565-1966 Electrical apparatus comprising resistors (*revised*)

1765-1966 dc potentiometers for laboratory and industrial uses (*revised*)

1885 (Part XI)-1966 Electrotechnical vocabulary: Part XI Electrical measurements

2032 (Part X)-1969 Graphical symbols used in electrotechnology: Part X Measuring instruments

2419-1963 Dimensions of electrical indicating instruments

2442-1963 dc moving coil galvanometers

2992-1965 Insulation resistance testers (hand-operated)

3107-1974 Portable multi-purpose direct acting electrical indicating instruments (*first revision*)

3635-1966 Methods of test for resistance of metallic electrical resistance materials

3636-1966 Method of test for temperature coefficient of precision resistor wires

6236-1971 Direct recording electrical measuring instruments

7889-1975 Vibration galvanometers

7890-1975 Ballistic galvanometers

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